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ELECTRIC POWER CAPACITY OF USSR BETWEEN 1940 AND 1950

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Approximate basic figures on the progress of electrification in USSR during and after World War II are as follows:

Table 1. Gross Production
of Industry

Year	Billions of Rubles	Percent of 1940	Percent of Pre- ceding Yr
1940	138	100	--
1941	--	--	--
1942	--	--	--
1943	--	--	--
1944	--	--	--
1945	--	--	--
1946	102	74	--
1947	124	90	121.5
1948	146	106	118.0
1949	172	124	118.0
1950	204	148	118.0

Table 2. Total Electric
Power Output in USSR

Year	Billion of Kw-h	Percent of 1940	Percent of Pre- ceding Yr	Kw-h per 1,000 Rubles of Industrial Production
1940	47.0	100	--	340
1941	--	--	--	--
1942	--	--	--	--
1943	--	--	--	--
1944	--	--	--	--
1945	--	--	--	--
1946	37.9	80	--	372
1947	46.7	100	125.0	377
1948	55.8	119	119.5	382
1949	66.6	142	119.3	387
1950	80.0	170	120.0	392

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Table 3. Capacities of Electric Power Stations

<u>Year</u>	<u>End of Yr</u> <u>(1,000 kw)</u>	<u>Percent</u> <u>of</u> <u>1940</u>	<u>Percent</u> <u>of Pre-</u> <u>ceding Yr</u>	<u>Capacity</u> <u>Lost Dur-</u> <u>ing War</u> (in thousands of kilowatts)	<u>Capacities</u> <u>Added</u>	<u>Avg</u> <u>Rated</u> <u>Capacity</u>	<u>Operating</u> <u>Hr per Yr</u>
1940	10,500	100	--	--	600	10,100	4,653
1941	6,830	65.0	65.0	4,170	500	--	--
1942	6,900	65.0	101.0	430	500	--	--
1943	7,400	70.5	107.2	--	500	--	--
1944	7,900	75.0	106.8	--	500	--	--
1945	8,400	80.0	106.3	--	500	--	--
1946	9,300	88.5	110.7	--	900	8,700	4,350
1947	11,300	107.6	117.7	--	2,000	9,960	4,680
1948	13,700	130.5	121.2	--	2,400	12,100	4,600
1949	16,700	159.0	121.9	--	3,000	14,700	4,530
1950	20,100	191.0	120.3	--	3,400	17,830	4,490

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Table 4. Capacities of Electric Power Systems (EPS)
and Electric Power Units (EPU) From 1940 to 1950

Name of EPS or EPU	Rated at	Lost	(Capacities in thousands of kilowatts)			Added in 1946 - 1947	At End of 1947	Added During Postwar 5-Yr Plan	At End of 1950
	End of 1940	During War	Restored Before 1946	At Begin- ning of 1946	At				
1. <u>Transcaucasia</u>									
Baku EPS	230	--	25	255		25	280	325	580
Georgian EPS	155	--	--	155		55	210	110	265
Armenian EPS	116	--	--	116		20	136	130	246
2. <u>Northern Caucasus</u>									
Groznyy-Ordzhonikidze EPS	81	--	--	81		--	81	187	268
Baksany-Mineral'nyye Vody EPS	31	31	6	6		--	6	25	31
Krasnodar EPS	28	28	10	10		6	18	12	28
Novorossiysk EPS	30	30	10	10		10	20	10	30
Mekhach-Kala EPU	18	--	12	30		--	30	24	54
Maykop EPU	10	10	6	6		6	12	25	37
Tuapse EPU	6	--	--	6		--	6	--	6
3. <u>Ukrainian SSR</u>									
Dnestr EPS	930	930	122	122		--	--	777	899
Donets EPS	900	900	175	175		--	--	685	860
Rostov EPS	226	226	50	50		--	--	202	252
Khar'kov EPS	181	181	50	50		--	--	111	161
Kiev EPS	96	96	20	20		--	--	52	72
Odessa EPS	40	40	10	10		--	--	30	40
Nikolayev EPS	43	43	18	18		--	--	50	68
4. <u>Crimean ASSR</u>									
Sevastopol' EPS	23	23	6	6		--	--	24	30
Kerch EPU	34	34	5	5		--	--	29	34

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5. Belorussian SSR

Minsk EPS	15	15	5	5	--	--	10	15
Orsha EPS	36	36	10	10	--	--	26	36

6. Central Region of European USSR

Moscow EPS	1,267	420	120	967	--	--	1,068	2,100
Yaroslavl' EPS	86	--	--	86	--	--	25	111
Ivanovo EPS	80	--	--	80	--	--	25	105
Malinin EPS	15	15	10	10	--	--	31	41
Gor'kiy EPS	290	--	25	315	--	--	50	365
Voronezh-Lipetsk EPS	79	55	25	49	--	--	50	99
Kursk EPU	10	10	5	5	--	--	25	30
Kazan' EPS	36	--	--	36	--	--	25	61
Tambov EPU	25	--	--	25	--	--	24	49
Bryansk EPS	40	40	12	12	--	--	28	40

7. North European USSR

Leningrad EPS	764	402	--	372	--	--	632	984
Murmansk EPS	77	--	22.5	99.5	--	--	67.5	167
Karel EPS	12	12	--	--	--	--	12	12
Arkhangel'sk EPU	34	--	25	59	--	--	50	109

8. Middle and Lower Volga Region

Kuybyshev EPS	95	--	25	120	--	--	75	195
Saratov EPS	49	--	12	61	--	--	50	111
Stalingrad EPS	130	105	25	50	--	--	80	130
Astrakhan' EPU	22	--	12	36	--	--	12	46

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9. Urals and Economically
Adjoining Regions

Ural EPS	970	--	400	1,370	--	--	1,300	2,670
Orsk EPS	50	--	50	100	--	--	75	175
Chkalov EPU	15	--	24	38	--	--	50	89
Ufa EPU	20	--	24	44	--	--	50	94
Karaganda EPU	30	--	50	80	--	--	150	230

10. Central Asia

Tashkent EPS	132	--	34.5	166.5	--	--	234.5	400
Fergana EPS	18	--	12	30	--	--	25	55
Balkhash EPU	50	--	25	75	--	--	25	100

11. Western Siberia

Omsk EPS	20	--	24	44	--	--	50	94
Novosibirsk EPS	60	--	100	160	--	--	200	360
Kemerovo-Kuznetsk EPS	260	--	150	410	--	--	300	710

12. Eastern Siberia

Cherekhovo EPU	10	--	14	24	--	--	36	60
Irkutsk EPU	20	--	36	56	--	--	50	106
Ulan-Udinsk EPU	20	--	12	32	--	--	24	56
Chita EPU	10	--	12	22	--	--	24	56

13. The Far East

Khabarovsk EPU	15	--	12	27	--	--	24	51
Komsomol'sk EPU	30	--	26	56	--	--	50	106
Vladivostok EPS	41	--	25	56	--	--	50	106
Total	8,050	3,672	1,900	6,280			7,691	13,971
Total Capacity of electric power stations of all sys- tems and units /sic/	2,450	918	600	2,120			4,009	6,129
(Grand total for USSR)	10,500	4,600	2,500	8,400	2,900	11,300	11,700	20,100

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The following notes are the author's explanations of how he arrived at the figures in the above tables.

Table 1. Gross Production of Industry

The figures given for 1940 are based on newspaper reports.

Production in the fourth quarter of 1947 exceeded average quarterly production in 1940, indicating that the level of total production in 1947, although still below 1940, was close to it. A rough estimate for 1947 is 90 percent of 1940, i.e., 124 billion rubles.

The estimate of 102 billion rubles for total production in 1946 is arrived at on the basis of the percentage increases in 1947 over 1946. The increase in 1947 over 1946 was 12 percent in the first quarter, 18 percent in the second, 26 percent in the third, and 30 percent in the fourth quarter. The average for the year was 21.5 percent.

The gross production for industry of 204 billion rubles for 1950 is the official plan figure.

The figures for 1948 and 1949 are based on the assumption that the 1950 plan will be fulfilled and that the average increase will be 18 percent. The table indicates that gross production for industry in the USSR during the postwar Five-Year Plan has risen 1.5 times over 1940.

Table 2. Total Electric Power Output in the USSR

The figure given for 1940 is close to the actual output figure of 47 billion kilowatt-hours.

The plan calls for 80 billion kilowatt-hours in 1950, according to Czechoslovak newspapers. Approximately the same figure will be arrived at if the planned production of electric power in the RSFSR for 1950, 56 billion kilowatt-hours, is divided by the ratio of the production of the RSFSR to the production of the entire USSR.

Electric power production during the postwar Five-Year Plan has increased 1.7 times over production in 1940, whereas industrial production for the same period has increased only 1.5 times.

This phenomena is explained as follows:

1. In 1940, the supply of electric power to other than war industries was strictly curtailed. Consequently, the communal economies, agriculture, and railways practically did not receive electric power. The 1950 plan not only does away with power restrictions, but also provides for the extensive electrification of railways and agriculture.

2. Industries requiring a large amount of electric power, such as those producing aluminum, magnesium, nickel, electric steel, copper, atomic energy, products of electrical chemistry, and others, have been developed extensively.

For these reasons the number of kilowatt-hours per 1,000 rubles of the gross production of industry has risen from 340 in 1940 to 392 in 1950.

Production figures for electric power in 1946, 1947, 1948, and 1949 are based on postwar increases in gross production for industry and increases in power consumption per unit of gross production for industry.

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Table 3. Capacities of Electric Power Stations

The 10.5 million kilowatts given for 1940 are approximate. The plan for 1950 calls for 20.1 million kilowatts. The Czechoslovak newspapers reported an increased capacity of 11.7 million kilowatts for the years 1946 - 1950 inclusive.

Approximately the same result would be obtained if 7,080,000 kilowatts, the increased capacity in the RSFSR according to the official plan, is divided by the ratio of the RSFSR's total electric power capacity to the capacity for the entire USSR.

The total capacity of USSR electric power stations during the period of the fourth Five-Year Plan increased to 191 percent of 1940, while the increase of power output for the same period was 170 percent. This is explained by the fact that in 1940 the power stations had to operate at maximum capacity, whereas in 1950 some reserve capacity was planned. As a result, the hours of utilization of the established average annual capacity decreased from 4,653 in 1940 to 4,490 in 1950.

Figures for the capacities of electric power stations during the war years take capacity losses in 1941 and 1942 into consideration. They are based on the assumption that the yearly addition of newly constructed capacities averaged 500,000 kilowatts during the war years. The correctness of this assumption is confirmed by the fact that information available on the capacities for 1947 agrees with the calculated figures. However, the checking of the above-given figures against newly obtained information is necessary.

The comprehensive information available on the performance of industries during 1947 and 1948 indicates that planned gross production was exceeded. For instance, in 1947 it was 21.5 percent over 1946 production, and in the first quarter of 1948 it was 32 percent over production during the first quarter of 1947, whereas the planned average yearly increase during the Five-Year Plan was fixed at slightly above 18 percent. As a result of these achievements, the completion of the Five-Year Plan in 4 years was decided and will probably be accomplished. Any question regarding the possibilities of exceeding the Five-Year Plan for electrification must take the following factors into consideration:

1. Although the general plan is being exceeded as far as production is concerned, construction, which also includes construction of power stations, power-consuming industries, and electrification of railroads, is behind the plan's requirements.
2. Consequently, the reserve capacity is still unavailable and electric power is still rationed, especially for communal needs and railroad transport. The figures given in the table will probably be close to the actual figures and changing them on the basis of the completion of the Five-Year Plan in 4 years is not advisable.

It is doubtful whether the figures given for the Five-Year Plan under "Capacities Added," will be realized. Just before the outbreak of the war, production of equipment for electric power stations, and also the working capacity of construction organizations, was barely sufficient for the annual construction of electric power stations with a total capacity of over one million kilowatts. A program of adding 2 or 3 million kilowatts a year is an enormous task for the USSR, involving many difficulties.

The following should be taken into consideration regarding the location of the electric power stations built during the postwar Five-Year Plan.

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The plan reflects the prewar decision of the government to build mainly medium-capacity electric power stations and not concentrate much capacity in a single point for military reasons. The construction of new industrial enterprises in large cities is prohibited. These rulings apply also to the construction of electric power stations, with the exception of TETs, which are essential for heating in large cities. In building steam-electric power stations, preference is given to TETs, which supply steam and hot water as well as electric power. Much attention is paid to the building of GES to provide cheap power for electric-power-consuming industries which are being developed. Many provisions are also made for the electrification of railroads and agriculture.

Table 4. Capacities of Electric Power Stations
and Electric Power Units From 1940 to 1950

The figures in Table 4 are based primarily on the assumption that the prewar plans for the construction of some power stations, which were known to the author, have been carried out. Knowledge of the prewar trends for developing electric power systems in the future also helped in the preparation of the table. The latter may serve as a basis for studying the distribution of electric power stations which existed or were under construction from 1940 to 1950.

The following notes discuss Table 4 by geographic areas:

1. Transcaucasia

The main increase in the capacity of the Baku electric power system will be achieved through the construction of the Mingechaur GES. The funds and materials for its construction had a high priority. Its capacity is unknown; however, it is estimated at approximately 250,000 kilowatts. Besides the petroleum industry, an aluminum combine will probably be located near the GES to utilize the Gandorin bauxite deposits. After completion of the Mingechaur GES, the Kirovobad electric power unit will become a part of the Baku power system.

The 110,000-kilowatt capacity of the Khrami GES has increased the capacity of the Georgian electric power system and will create normal conditions for operating that system.

The Armenian electric power system's capacity will be increased by 130,000 kilowatts, the combined capacity of the Ozernaya and Gyumush GES. It is presumed that aluminum industries will be located in Armenia.

2. Northern Caucasus

The Groznyy-Ordzhonikidze electric power system will be reinforced by building the Dzardzhikau GES, with a capacity of presumably 150,000 kilowatts, and possibly the Achalukhi GES, with a capacity of 12,000 kilowatts, for which construction plans were prepared before the war.

The power station of the Baksany-Mineral'nyye Vody electric power system, which was destroyed during the war, will be restored.

The Krasnodar and Novorossiysk electric power systems and the Maykop and the Tuapse electric power units will be consolidated into one system as soon as the construction of the Maykop GES, capacity of which is unknown, is completed.

In the Makhach-Kala unit, the existing TsES, which is operated by the Ministry of Shipbuilding Industry, is being enlarged and a new TETs is under construction to fulfill the requirements of the petroleum industry.

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3. Ukrainian SSR

The war-damaged capacities of the Dnepr electric power system are being restored. Probably electric power stations No 6, 7, and 8 will not be restored.

The war-damaged power stations of the Donets are also being restored.

In the Rostov system, all the power stations, with the exception of No 2, are being restored. The capacity of the Nesvetay GRES was increased in 1940 from 50,000 kilowatts to 100,000 kilowatts.

Restoration work is taking place on the Khar'kov, Kiev, and Odessa systems.

The war-damaged power stations of the Nikolayev system are being restored. The capacity of the Nikolayev TETs will be increased by 50,000 kilowatts over 1940.

4. Crimean ASSR

Electric power facilities are being restored.

5. Belorussian SSR

Only the restoration of electric power facilities is taking place.

6. Central Region of European USSR

The total capacity of the Moscow system is being doubled by restoring the Stalinogorsk GRES, by building a new TETs in Moscow, new GES on the Vyshniy Volochek waterway and Oka River, and electric power station No 20.

The capacity of the Yaroslavl', Ivanovo, and Kalinin systems will be increased by enlarging the Yaroslavl', Ivanovo, and Kalinin TETs. The systems will be merged with the Moscow system as soon as the GES on the Vyshniy Volochek waterway, at Rybinsk, and at Uglich are put into operation.

In the Voronezh-Lipetsk system, the capacity of the Lipetsk TsES is being increased to 49,000 kilowatts.

The new TETs which are under construction include one at Kursk for the Kursk power system, with a capacity of 24,000 kilowatts, another at Kazan for the Kazan' electric power system, with a capacity of 25,000 kilowatts, and a third at Tambov for the Tambov electric power unit, with a capacity of 24,000 kilowatts. The damage sustained by the Bryansk system during the war is being repaired.

7. North European Russia

In the Leningrad system, electric power stations No 1, 2, 4, 6, 7, 9, and 10 are in operation already; No 3, 5, and 8 are being restored; and new power stations No 11 and 12 are under construction. (It is not certain whether station No 4 was destroyed during the war.)

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In the Murmansk system, Niva GES No 2 and Niva GES No 3, whose capacities are unknown, are under construction to fulfill the electric power requirements of nickel and aluminum combines. The GES are listed in the table and their capacities are estimated at 45,000 kilowatts each. A Niva GES is built underground. Evidently, the Kechum GES, which is under construction, is also located in this region, but it is not listed in the table.

In the Kareliya electric power unit, the Kandalaksha GES is being restored.

In the Arkhangelsk' unit, the TETs belonging to the shipbuilding plant is being enlarged.

8. Middle and Lower Volga Region

The capacity of the Kuybyshev system will be increased by enlarging the Beryuzansk TETs and possibly the Syzran' TETs.

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